

For references containin information on multiple test organisms, durations, and/or effects in the TSCA Risk Evaluation of Asbestos, multiple data quality evaluation tables are provided *only if* the metrics were evaluated differently. Some papers that underwent evaluatoin but fell off-topic later on are not summarized in the data evaluation tables. Refer to Appendix F of '*Application of Systematic Review in TSCA Risk Evaluations*' at <https://www.epa.gov> for more information of evaluation procedures and parameters.

Table 1: Data Evaluation table for reference 621276 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference_id/621276).

Study Citation:	Trivedi, A. K.,Ahmad, I.,Musthapa, M. S.,Ansari, F. A.. 2007. Environmental contamination of chrysotile asbestos and its toxic effects on antioxidative system of Lemna gibba. Archives of Environmental Contamination and Toxicology 52:355-362					
Data Type:	Chronic (>21 days); Aquatic; Plants					
Hero ID:	621276					
Domain	Metric		Rating [†]	MWF*	Score	Comments ^{††}
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	The test substance was identified definitively.
	Metric 2:	Test Substance Source	Low	× 1	3	Although the test material source not defined there is no indication this impacted the results of the study.
	Metric 3:	Test Substance Purity	Low	× 1	3	Although the purity was not reported, there is no indication that this had an effect on the results.
Domain 2: Test Design						
	Metric 4:	Negative Controls	Medium	× 2	4	Although aquatic plants used as controls were cultured in nutrient mediumwithout chrysotile fiber, they were from the third generation of plants obtained from a natural habitat in an aquatic body that was contaminated with asbestos. There are uncertainties (e.g., due to epigenetics) around how the initial exposure to asbestos at the parent generation would affect the plants from the third generation.
	Metric 5:	Negative Control Response	Medium	× 1	2	There were minor uncertainties or limitations regarding the biological responses of the negative control group(s).
	Metric 6:	Randomized Allocation	Low	× 1	3	Researchers did not report how organisms were allocated to study group.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Unacceptable		4	The test organisms were cultured in a media containing asbestos, while also being exposed at a rate that is reported in terms of exposure per frond. The authors did not provide sufficient detail about the test organisms or exposure regime (ex. how many fronds per plant? Does excess test media applied to fronds enter the test suspension?) to allow the reviewer to confirm the scientific validity of this study.
Continued on next page ...						

...continued from previous page

Study Citation: Trivedi, A. K.,Ahmad, I.,Musthapa, M. S.,Ansari, F. A.. 2007. Environmental contamination of chrysotile asbestos and its toxic effects on antioxidative system of Lemna gibba. Archives of Environmental Contamination and Toxicology 52:355-362

Data Type: Chronic (>21 days); Aquatic; Plants

Hero ID: 621276

Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
3	Metric 8: Consistency of Exposure Administration	Unacceptable		4	There were serious flaws in how the aquatic plants were exposed to asbestos. The authors described the test media as containing asbestos, while describing the exposure of asbestos to the fronds. This led the reviewer to question the source of the effects observed in this study and whether it was due to asbestos in the media or the asbestos applied to the frond. In addition, the lack of detail about the procedure used to apply asbestos to the fronds meant that the exposure cannot be adequately understood from the information provided in this study.
	Metric 9: Measurement of Test Substance Concentration	N/A		N/A	Exposure concentrations to fronds in the plants were not measured due to the insoluble nature of asbestos fibers.
	Metric 10: Exposure Duration and Frequency	High	× 2	2	Experiments were carried out for a test duration of 28 days. EPA determined this to be acceptable.
	Metric 11: Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	There were no Justifications provided for the selection of the test concentrations.
	Metric 12: Testing at or Below Solubility Limit	N/A		N/A	Test media was left in suspension because asbestos is an insoluble particle. .
Domain 4: Test Organism					
	Metric 13: Test Organism Characteristics	Medium	× 2	4	There are minor reservations or uncertainties about the source of test organisms.
	Metric 14: Acclimitization and Pretreatment Conditions	Unacceptable		4	Plants were cultured in a media containing asbestos which may interfere with the ability of the authors to adequately quantify the effects of the test material.
	Metric 15: Number of Organisms and Replicates per Group	High	× 1	1	The numbers of test organisms and replicates were reported and sufficient to characterize toxicological effects.
	Metric 16: Adequacy of Test Conditions	Unacceptable		4	Plants were cultured in a media containing asbestos in addition to having suspensions containing asbestos applied to their fronds.
Domain 5: Outcome Assessment					
	Metric 17: Outcome Assessment Methodology	Low	× 2	6	The results were sufficiently reported, but uncertainties regarding the exposure led the reviewer to question the applicability of the results.

Continued on next page ...

...continued from previous page

Study Citation:	Trivedi, A. K.,Ahmad, I.,Musthapa, M. S.,Ansari, F. A.. 2007. Environmental contamination of chrysotile asbestos and its toxic effects on antioxidative system of Lemna gibba. Archives of Environmental Contamination and Toxicology 52:355-362				
Data Type:	Chronic (>21 days); Aquatic; Plants				
Hero ID:	621276				
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
	Metric 18: Consistency of Outcome Assessment	Medium	× 1	2	There were incomplete reporting of minor details of outcome assessment protocol execution, but these uncertainties or limitations are unlikely to have substantial impact on results.
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	Medium	× 2	4	The study reported minor differences among the study groups with respect to environmental conditions or other non-treatment-related factors, but these are unlikely to have a substantial impact on results.
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	There were no differences among groups that could influence the outcome assessment.
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	Statistical methods were clearly described and appropriate for dataset(s).
	Metric 22: Reporting of Data	Unacceptable		4	Results were reported in terms of asbestos applied to each frond, but there were critical details lacking about the characteristics of the test organisms, particularly regarding the number of fronds /plant.
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	There were no unexpected outcomes, or unexpected outcomes were satisfactorily explained.
Overall Quality Determination [‡]		Unacceptable		4.0	
Extracted		No			
Continued on next page ...					

...continued from previous page

Study Citation: Trivedi, A. K., Ahmad, I., Musthapa, M. S., Ansari, F. A.. 2007. Environmental contamination of chrysotile asbestos and its toxic effects on antioxidative system of Lemna gibba. Archives of Environmental Contamination and Toxicology 52:355-362

Data Type: Chronic (>21 days); Aquatic; Plants

Hero ID: 621276

Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
--------	--------	---------------------	------	-------	------------------------

* MWF = Metric Weighting Factor

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) / \sum_j \text{MWF}_j \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases}$$

where High = ≥ 1 to < 1.7 ; Medium = ≥ 1.7 to < 2.4 ; Low = ≥ 2.4 to < 3 . If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

^{††} Reviewers document uncertainties and strengths for each metric, when deemed necessary.

** Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. **(a)** High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. **(b)** Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. **(c)** Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. **(d)** Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. **(e)** Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 2: Data Evaluation table for reference 3080106 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference_id/3080106).

Study Citation:	Trivedi, A. K.,Ahmad, I.,Musthapa, M. S.,Ansari, F. A.,Rahman, Q.. 2004. Environmental contamination of chrysotile asbestos and its toxic effects on growth and physiological and biochemical parameters of Lemna gibba. Archives of Environmental Contamination and Toxicology 47:281-289					
Data Type:	Chronic (>21 days); Aquatic; Plants					
Hero ID:	3080106					
Domain	Metric		Rating [†]	MWF*	Score	Comments ^{††}
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	The test substance was identified definitively.
	Metric 2:	Test Substance Source	Low	× 1	3	Although the test material source not defined there is no indication this impacted the results of the study.
	Metric 3:	Test Substance Purity	Low	× 1	3	Although the purity was not reported, there is no indication that this had an effect on the results.
Domain 2: Test Design						
	Metric 4:	Negative Controls	Medium	× 2	4	Although aquatic plants used as controls were cultured in nutrient mediumwithout chrysotile fiber, they were from the third generation of plants obtained from a natural habitat in an aquatic body that was contaminated with asbestos. There are uncertainties (e.g., due to epigenetics) around how the initial exposure to asbestos at the parent generation would affect the plants from the third generation.
	Metric 5:	Negative Control Response	Medium	× 1	2	There were minor uncertainties or limitations regarding the biological responses of the negative control group(s).
	Metric 6:	Randomized Allocation	Low	× 1	3	Researchers did not report how organisms were allocated to study group.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	Unacceptable		4	The test organisms were cultured in a media containing asbestos, while also being exposed at a rate that is reported in terms of exposure per frond. The authors did not provide sufficient detail about the test organisms or exposure regime (ex. how many fronds per plant? Does excess test media applied to fronds enter the test suspension?) to allow the reviewer to confirm the scientific validity of this study.
Continued on next page ...						

...continued from previous page

Study Citation:	Trivedi, A. K.,Ahmad, I.,Musthapa, M. S.,Ansari, F. A.,Rahman, Q.. 2004. Environmental contamination of chrysotile asbestos and its toxic effects on growth and physiological and biochemical parameters of Lemna gibba. Archives of Environmental Contamination and Toxicology 47:281-289
Data Type:	Chronic (>21 days); Aquatic; Plants
Hero ID:	3080106

Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
	Metric 8: Consistency of Exposure Administration	Unacceptable		4	There were serious flaws in how the aquatic plants were exposed to asbestos. The authors described the test media as containing asbestos, while describing the exposure of asbestos to the fronds. This led the reviewer to question the source of the effects observed in this study and whether it was due to asbestos in the media or the asbestos applied to the frond. In addition, the lack of detail about the procedure used to apply asbestos to the fronds meant that the exposure cannot be adequately understood from the information provided in this study.
	Metric 9: Measurement of Test Substance Concentration	N/A		N/A	Exposure concentrations to fronds in the plants were not measured due to the insoluble nature of asbestos fibers.
	Metric 10: Exposure Duration and Frequency	High	× 2	2	Experiments were carried out for a test duration of 28 days. EPA determined this to be acceptable.
	Metric 11: Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	There were no Justifications provided for the selection of the test concentrations.
	Metric 12: Testing at or Below Solubility Limit	N/A		N/A	Test media was left in suspension because asbestos is an insoluble particle.
Domain 4: Test Organism					
	Metric 13: Test Organism Characteristics	Medium	× 2	4	There are minor reservations or uncertainties about the source of test organisms.
	Metric 14: Acclimitization and Pretreatment Conditions	Unacceptable		4	Plants were cultured in a media containing asbestos which may interfere with the ability of the authors to adequately quantify the effects of the test material.
	Metric 15: Number of Organisms and Replicates per Group	High	× 1	1	The numbers of test organisms and replicates were reported and sufficient to characterize toxicological effects.
	Metric 16: Adequacy of Test Conditions	Unacceptable		4	Plants were cultured in a media containing asbestos in addition to having suspensions containing asbestos applied to their fronds.
Domain 5: Outcome Assessment					
Continued on next page ...					

...continued from previous page

Study Citation:	Trivedi, A. K.,Ahmad, I.,Musthapa, M. S.,Ansari, F. A.,Rahman, Q.. 2004. Environmental contamination of chrysotile asbestos and its toxic effects on growth and physiological and biochemical parameters of Lemna gibba. Archives of Environmental Contamination and Toxicology 47:281-289				
Data Type:	Chronic (>21 days); Aquatic; Plants				
Hero ID:	3080106				
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
	Metric 17: Outcome Assessment Methodology	Low	× 2	6	The results were sufficiently reported, but uncertainties regarding the exposure led the reviewer to question the applicability of the results.
	Metric 18: Consistency of Outcome Assessment	Medium	× 1	2	There were incomplete reporting of minor details of outcome assessment protocol execution, but these uncertainties or limitations are unlikely to have substantial impact on results.
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	Medium	× 2	4	The study reported minor differences among the study groups with respect to environmental conditions or other non-treatment-related factors, but these are unlikely to have a substantial impact on results.
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	There were no differences among groups that could influence the outcome assessment.
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	Statistical methods were clearly described and appropriate for dataset(s).
	Metric 22: Reporting of Data	Unacceptable		4	Results were reported in terms of asbestos applied to each frond, but there were critical details lacking about the characteristics of the test organisms, particularly regarding the number of fronds /plant.
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	There were no unexpected outcomes, or unexpected outcomes were satisfactorily explained.
Overall Quality Determination [‡]		Unacceptable		4.0	
Extracted		No			
Continued on next page ...					

...continued from previous page

Study Citation: Trivedi, A. K.,Ahmad, I.,Musthapa, M. S.,Ansari, F. A.,Rahman, Q.. 2004. Environmental contamination of chrysotile asbestos and its toxic effects on growth and physiological and biochemical parameters of Lemna gibba. Archives of Environmental Contamination and Toxicology 47:281-289

Data Type: Chronic (>21 days); Aquatic; Plants

Hero ID: 3080106

Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
--------	--------	---------------------	------	-------	------------------------

* MWF = Metric Weighting Factor

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \frac{\sum_i (\text{Metric Score}_i \times \text{MWF}_i)}{\sum_j \text{MWF}_j} \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High= ≥ 1 to < 1.7 ; Medium = ≥ 1.7 to < 2.4 ; Low = ≥ 2.4 to < 3 . If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

^{††} Reviewers document uncertainties and strengths for each metric, when deemed necessary.

^{***} Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool.(a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 3: Data Evaluation table for reference 3093600 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference_id/3093600).

Study Citation:		Belanger, S. E.,Cherry, D. S.,Cairns J, J. R.. 1986. UPTAKE OF CHRYSOTILE ASBESTOS FIBERS ALTERS GROWTH AND REPRODUCTION OF ASIATIC CLAMS. Canadian Journal of Fisheries and Aquatic Sciences 43:43-52				
Data Type:		Chronic (>21 days); Aquatic; Invertebrates				
Hero ID:		3093600				
Domain		Metric	Rating [†]	MWF*	Score	Comments ^{††}
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	Grade 5 chrysotile asbestos mined ore was used.
	Metric 2:	Test Substance Source	Low	× 1	3	The study authors did not report the specific commercial supplier or batch/lot # used to obtain the test substance.
	Metric 3:	Test Substance Purity	Low	× 1	3	The study authors mentioned "Grade 5 chrysotile asbestos" was used but did not define what the "Grade 5" represents.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	The study authors used an appropriate concurrent negative control group (i.e., all conditions equal except chemical exposure).
	Metric 5:	Negative Control Response	High	× 1	1	The biological responses (e.g., survival, growth, reproduction, etc.) of the negative control group(s) were adequate.
	Metric 6:	Randomized Allocation	Low	× 1	3	Study authors obtained clams from New River, Virginia and transported these clams to their lab at Virginia Tech. There were no discussions about separating these clams into formal randomized groups.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	The experimental system and methods for preparation of test media were described in adequate detail and appropriately accounted for the physical-chemical properties of the test substance.
	Metric 8:	Consistency of Exposure Administration	Low	× 1	3	Difficulties with measuring asbestos accurately posed challenges in consistent administration of test substance. Study authors used nominal concentrations of asbestos in their experiments and mentioned that the detection limits for all concentrations ranged from 1.79E4 to 6.91E4 fibers. However, they tested concentrations up to 10E8. Although troubling, this issue is an inherent challenge to asbestos, a difficult to test chemical.
Continued on next page ...						

... continued from previous page

Study Citation:	Belanger, S. E., Cherry, D. S., Cairns J, J. R.. 1986. UPTAKE OF CHRYSOTILE ASBESTOS FIBERS ALTERS GROWTH AND REPRODUCTION OF ASIATIC CLAMS. Canadian Journal of Fisheries and Aquatic Sciences 43:43-52				
Data Type:	Chronic (>21 days); Aquatic; Invertebrates				
Hero ID:	3093600				

Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
	Metric 9: Measurement of Test Substance Concentration	N/A		N/A	Nominal values are highly uncertain due to the nature of the test substance. As a result, the effect concentrations reported in this study may misrepresent the actual effect concentrations.
	Metric 10: Exposure Duration and Frequency	High	× 2	2	The duration of exposures and/or exposure frequency were reported and appropriate for the study type and/or outcome(s) of interest.
	Metric 11: Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	The number of exposure groups and spacing of exposure levels were justified by study authors, adequate to address the purpose of the study (e.g., the selected doses produce a range of responses), and allowed for identification of endpoint values.
	Metric 12: Testing at or Below Solubility Limit	N/A		N/A	Asbestos fibers are insoluble in water and organic solvents.
II	Domain 4: Test Organism				
	Metric 13: Test Organism Characteristics	High	× 2	2	The test organisms were adequately described and were obtained from a reliable source. The test organisms were appropriate for evaluation of the specific outcome(s) of interest.
	Metric 14: Acclimitization and Pretreatment Conditions	High	× 1	1	Clams were acclimatized to laboratory conditions for 1-2 weeks prior to experiments and all pretreatment conditions were the same for control and exposed populations
	Metric 15: Number of Organisms and Replicates per Group	Medium	× 1	2	The numbers of test organisms and replicates were sufficient to characterize toxicological effects, but minor uncertainties or limitations were identified regarding the number of test organisms and/or replicates that are unlikely to have a substantial impact on results.
	Metric 16: Adequacy of Test Conditions	High	× 1	1	Clams were adequately housed and fed in exposure system.
	Domain 5: Outcome Assessment				
	Metric 17: Outcome Assessment Methodology	High	× 2	2	Measured endpoints that were able to detect a true biological effect or hazard.
Continued on next page ...					

... continued from previous page

Study Citation:	Belanger, S. E., Cherry, D. S., Cairns J, J. R.. 1986. UPTAKE OF CHRYSOTILE ASBESTOS FIBERS ALTERS GROWTH AND REPRODUCTION OF ASIATIC CLAMS. Canadian Journal of Fisheries and Aquatic Sciences 43:43-52				
Data Type:	Chronic (>21 days); Aquatic; Invertebrates				
Hero ID:	3093600				
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	Details of the outcome assessment protocol were reported and outcomes were assessed consistently across study groups (e.g., at the same time after initial exposure) using the same protocol in all study groups.
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	There were no reported differences among the study groups in environmental conditions or other factors that could influence the outcome assessment.
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	Details regarding test organism attrition and outcomes unrelated to exposure (e.g., infection) were reported for each study group and there were no differences among groups that could influence the outcome assessment.
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	Kruskal-Wallis test used was adequate for test objectives. Statistical methods were clearly described and appropriate for dataset(s).
	Metric 22: Reporting of Data	High	× 2	2	Data for exposure-related findings were presented for each treatment and control group and were adequate to determine values for the endpoint(s) of interest.
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	There were no unexpected outcomes, or unexpected outcomes were satisfactorily explained.
Overall Quality Determination [‡]		High		1.3	
Extracted		Yes			
Continued on next page ...					

... continued from previous page

Study Citation:	Belanger, S. E.,Cherry, D. S.,Cairns J, J. R.. 1986. UPTAKE OF CHRYSOTILE ASBESTOS FIBERS ALTERS GROWTH AND REPRODUCTION OF ASIATIC CLAMS. Canadian Journal of Fisheries and Aquatic Sciences 43:43-52				
Data Type:	Chronic (>21 days); Aquatic; Invertebrates				
Hero ID:	3093600				
Domain	Metric	Rating [†]	MWF [*]	Score	Comments ^{††}

* MWF = Metric Weighting Factor

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) / \sum_j \text{MWF}_j \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High= ≥ 1 to < 1.7 ; Medium = ≥ 1.7 to < 2.4 ; Low = ≥ 2.4 to < 3 . If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

^{††} Reviewers document uncertainties and strengths for each metric, when deemed necessary.

^{**} Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 4: Data Evaluation table for reference 3093856 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference_id/3093856).

Study Citation:	Belanger, S. E.,Cherry, D. S.,Cairns J, J. R.. 1986. SEASONAL BEHAVIORAL AND GROWTH CHANGES OF JUVENILE CORBICULA-FLUMINEA EXPOSED TO CHRYSOTILE ASBESTOS. Water Research 20:1243-1250					
Data Type:	Chronic (>21 days); Aquatic; Invertebrates					
Hero ID:	3093856					
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}	
Domain 1: Test Substance						
Metric 1:	Test Substance Identity	High	× 2	2	Chrysotile asbestos	
Metric 2:	Test Substance Source	Low	× 1	3	Source of asbestos not specified	
Metric 3:	Test Substance Purity	High	× 1	1	Test is conducted with a fiber; Asbestos fiber used in exposures were prepared by lightly 400 mg of asbestos, followed by sonicating 500 ml of a 0.060mg/l -j chrysotile stock for 2h with a Fisher ultrasonic cleaner to eliminate large blocks and cleavage fragments. Micrographs were taken of the 15-25 fibers encountered and subsequently measured for length, width and aspect ratio.	
Domain 2: Test Design						
Metric 4:	Negative Controls	High	× 2	2		
Metric 5:	Negative Control Response	High	× 1	1		
Metric 6:	Randomized Allocation	Medium	× 1	2	randomization procedure not specified, no evidence that this affected the results of the study	
Domain 3: Exposure Characterization						
Metric 7:	Experimental System/Test Media Preparation		× 2	6	Asbestos fiber stocks used in exposures were prepared by lightly milling 400 mg of asbestos, followed by sonicating 500 ml of a 0.060mg/l -j chrysotile stock for 2h with a Fisher ultrasonic cleaner to eliminate large blocks and cleavage fragments. Suspension of asbestos fibers was maintained through magnetic stirring.	
Metric 8:	Consistency of Exposure Administration	High	× 1	1	Clams were exposed to 0, 10 ² , 10 ⁴ , 10 ⁵ , 10 ⁶ , 10 ⁷ , 10 ⁸ fibers /l m chrysotile asbestos. aquaria stirred above a magnetic stirrer that kept asbestos in suspension.	
Continued on next page ...						

...continued from previous page

Study Citation:	Belanger, S. E.,Cherry, D. S.,Cairns J, J. R.. 1986. SEASONAL BEHAVIORAL AND GROWTH CHANGES OF JUVENILE CORBICULA-FLUMINEA EXPOSED TO CHRYSOTILE ASBESTOS. Water Research 20:1243-1250					
Data Type:	Chronic (>21 days); Aquatic; Invertebrates					
Hero ID:	3093856					
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}	
	Metric 9: Measurement of Test Substance Concentration	High	× 1	1	Asbestos fiber concentrations in water were determined by the TEM method described above that water samples were directly filtered onto pore filters. Background and blanks were processed simultaneously. Measured asbestos concentrations for 0, 10 ² , 10 ⁴ , 10 ⁵ , 10 ⁶ and 10 ⁸ fibers/L were detected at 0, 10 ⁴ , 5.7 x 10 ⁵ , 1.3 x 10 ⁷ and 2.3 x 10 ⁸ fibers/L, respectively. 30-day exposure	
	Metric 10: Exposure Duration and Frequency	High	× 2	2		
	Metric 11: Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1		
	Metric 12: Testing at or Below Solubility Limit		N/A	Insoluble fiber maintained in a suspension		
Domain 4: Test Organism						
	Metric 13: Test Organism Characteristics	Medium	× 2	4	Juvenile Corbicula (5.2-8.6 mm shell length) were collected from the New River, Va, by dip netting adjacent to an industrial pumphouse station (Ciba-Fibers Corp., Narrows, Va). It was uncertain if the collection site was polluted, but the controls showed no ill effects, or accumulated fibers so it was assumed that this collection site was appropriate. Juvenile clams were sorted from adults and acclimated in the field and returned to Virginia Institute of Marine Science where they were acclimated to constant temperature (20°C)laboratory conditions for 7 days in aquaria. 10 clams/group Groups of 10 clams were placed in a raised plastic platform of 315 cm ² surface area in each tank	
	Metric 14: Acclimitization and Pretreatment Conditions	High	× 1	1		
	Metric 15: Number of Organisms and Replicates per Group	High	× 1	1		
	Metric 16: Adequacy of Test Conditions	High	× 1	1		
Domain 5: Outcome Assessment						
	Metric 17: Outcome Assessment Methodology	High	× 2	2		
	Metric 18: Consistency of Outcome Assessment	High	× 1	1		
Domain 6: Confounding / Variable Control						
Continued on next page ...						

...continued from previous page

Study Citation:	Belanger, S. E., Cherry, D. S., Cairns J, J. R.. 1986. SEASONAL BEHAVIORAL AND GROWTH CHANGES OF JUVENILE CORBICULA-FLUMINEA EXPOSED TO CHRYSOTILE ASBESTOS. Water Research 20:1243-1250				
Data Type:	Chronic (>21 days); Aquatic; Invertebrates				
Hero ID:	3093856				
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	
	Metric 20: Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	Nonparametric statistical techniques were applied to all analyses. The one-way analysis of variance analogue, the Kruskal-Wallis Test, was used for one-way layout data. If significant differences were indicated (α = 0.05), a rank-like Least Significant Differences Procedure was used to determine the relationships between groups. In cases of two samples (e.g. planimetric analysis of gill tissue), Wilcoxon Rank Sum Test was used to test differences between groups.
	Metric 22: Reporting of Data	High	× 2	2	
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality Determination [‡]		High		1.1	
Extracted		Yes			

* MWF = Metric Weighting Factor

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \frac{\sum_i (\text{Metric Score}_i \times \text{MWF}_i)}{\sum_j \text{MWF}_j} \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases}$$

where High = ≥ 1 to < 1.7 ; Medium = ≥ 1.7 to < 2.4 ; Low = ≥ 2.4 to < 3 . If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

^{††} Reviewers document uncertainties and strengths for each metric, when deemed necessary.

^{**} Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the character of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently used to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of the metric is not applicable to the data/information source being evaluated [no score].

Table 5: Data Evaluation table for reference 3584231 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference_id/3584231).

Study Citation:		Belanger, S. E.,Schurr, K.,Allen, D. J.,Gohara, A. F.. 1986. Effects of chrysotile asbestos on coho salmon and green sunfish: evidence of behavioral and pathological stress. Environmental Research 39:74-85				
Data Type:		Chronic (>21 days); Aquatic; Fish				
Hero ID:		3584231				
Domain		Metric	Rating [†]	MWF*	Score	Comments ^{††}
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	High	× 2	2	Asbestos was in the form of mined chrysotile.
	Metric 2:	Test Substance Source	Medium	× 1	2	Asbestos used in this study was a gift from a major asbestos producer.
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity and/or grade of test substance were not reported. The test chemical was in the form of mined chrysotile.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	Study authors reported using an appropriate concurrent negative control group.
	Metric 5:	Negative Control Response	High	× 1	1	The biological responses of the negative control group(s) were adequate (e.g., mortality of control fish "20 percent in the chronic tests).
	Metric 6:	Randomized Allocation	High	× 1	1	The study reported that organisms were randomly allocated into study groups.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	The experimental system and methods for preparation of test media were described in adequate detail and appropriately accounted for the physical-chemical properties of the test substance.
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	Test organisms were consistently dosed with asbestos (i.e., only once at the beginning of the experiment).
	Metric 9:	Measurement of Test Substance Concentration	N/A		N/A	Nominal values are highly uncertain due to the nature of the test substance. As a result, the effect concentrations reported in this study may misrepresent the actual effect concentrations.
	Metric 10:	Exposure Duration and Frequency	High	× 2	2	Test organisms were dosed with asbestos only once at the beginning of the experiment. This is sufficient because asbestos fibers are insoluble and the possibility of the fibers degrading during the experiment is low. The length of exposure was adequate for the objectives of the experiments.
Continued on next page ...						

... continued from previous page

Study Citation:	Belanger, S. E., Schurr, K., Allen, D. J., Gohara, A. F.. 1986. Effects of chrysotile asbestos on coho salmon and green sunfish: evidence of behavioral and pathological stress. Environmental Research 39:74-85				
Data Type:	Chronic (>21 days); Aquatic; Fish				
Hero ID:	3584231				
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
	Metric 11: Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	Two levels of exposure were used (i.e., 1.5E6 and 3E6 fibers/liter). These concentrations are similar to concentrations found in many aquatic environments at the time of the study.
	Metric 12: Testing at or Below Solubility Limit	N/A		N/A	Asbestos fibers are insoluble in water and organic solvents. Nominal values are highly uncertain due to the nature of the test substance. The effect concentrations reported in these studies may misrepresent the actual effect concentrations.
Domain 4: Test Organism					
	Metric 13: Test Organism Characteristics	High	× 2	2	This study was designed to evaluate the effects of chrysotile asbestos on recently hatched coho salmon larvae (<i>Oncorhynchus kisutch</i>) and juvenile green-sunfish (<i>Lepomis cyanellus</i>). These species and life stages were chosen due to the importance of salmonids (e.g., coho) in the Great Lakes ecosystem and the probable susceptibility of young fish to asbestos intoxication. The test organisms were adequately described and were obtained from a reliable source.
	Metric 14: Acclimatization and Pretreatment Conditions	High	× 1	1	Fish were allowed to acclimate for 5 days at room temperature (20.0 ± 2.0°C) and were randomly divided into six groups of 20 fish each. The test organisms were acclimatized to test conditions and all pretreatment conditions were the same for control and exposed populations, such that the only difference was exposure to test substance.
	Metric 15: Number of Organisms and Replicates per Group	Medium	× 1	2	The numbers of test organisms and replicates were sufficient to characterize toxicological effects, but minor uncertainties or limitations were identified regarding the number of test organisms and/or replicates that are unlikely to have a substantial impact on results.
	Metric 16: Adequacy of Test Conditions	High	× 1	1	Organism housing, environmental conditions, food, water, and nutrients were conducive to maintenance of health and biomass loading was appropriate.
Domain 5: Outcome Assessment					
Continued on next page ...					

... continued from previous page

Study Citation:	Belanger, S. E., Schurr, K., Allen, D. J., Gohara, A. F.. 1986. Effects of chrysotile asbestos on coho salmon and green sunfish: evidence of behavioral and pathological stress. Environmental Research 39:74-85				
Data Type:	Chronic (>21 days); Aquatic; Fish				
Hero ID:	3584231				
Domain	Metric	Rating [†]	MWF [*]	Score	Comments ^{††}
	Metric 17: Outcome Assessment Methodology	High	× 2	2	The outcome assessment methodology addressed or reported the intended outcome(s) of interest and was sensitive for the outcomes(s) of interest.
	Metric 18: Consistency of Outcome Assessment	Medium	× 1	2	Details of the outcome assessment protocol were reported but the outcomes were not assessed consistently across study. The experiments with higher concentrations of asbestos occurred for a lesser duration compare to the experiments with lower concentrations of asbestos.
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	There were no reported differences among the study groups in environmental conditions or other factors that could influence the outcome assessment.
	Metric 20: Outcomes Unrelated to Exposure	Medium	× 1	2	Data on attrition and/or outcomes unrelated to exposure were not reported for each study group, but this deficiency is not likely to have a substantial impact on results.
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	Statistical methods were clearly described and appropriate for dataset(s).
	Metric 22: Reporting of Data	High	× 2	2	Data for exposure-related findings were presented for each treatment and control group and were adequate to determine values for the endpoint(s) of interest. Negative findings were reported qualitatively or quantitatively.
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	There were no unexpected outcomes, or unexpected outcomes were satisfactorily explained.
Overall Quality Determination [‡]		High		1.2	
Extracted		Yes			
Continued on next page ...					

... continued from previous page

Study Citation:	Belanger, S. E.,Schurr, K.,Allen, D. J.,Gohara, A. F.. 1986. Effects of chrysotile asbestos on coho salmon and green sunfish: evidence of behavioral and pathological stress. Environmental Research 39:74-85				
Data Type:	Chronic (>21 days); Aquatic; Fish				
Hero ID:	3584231				
Domain	Metric	Rating [†]	MWF [*]	Score	Comments ^{††}

* MWF = Metric Weighting Factor

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) / \sum_j \text{MWF}_j \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases},$$

where High= ≥ 1 to < 1.7 ; Medium = ≥ 1.7 to < 2.4 ; Low = ≥ 2.4 to < 3 . If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

^{††} Reviewers document uncertainties and strengths for each metric, when deemed necessary.

^{**} Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 6: Data Evaluation table for reference 3585046 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference_id/3585046).

Study Citation:	Belanger, S. E.,Cherry, D. S.,Cairns, J.. 1990. FUNCTIONAL AND PATHOLOGICAL IMPAIRMENT OF JAPANESE MEDAKA (ORYZIAS-LATIPES) BY LONG-TERM ASBESTOS EXPOSURE. Aquatic Toxicology 17:133-154					
Data Type:	Chronic (>21 days); Aquatic; Fish					
Hero ID:	3585046					
Domain		Metric	Rating [†]	MWF*	Score	Comments ^{††}
Domain 1: Test Substance						
	Metric 1:	Test Substance Identity	Medium	× 2	4	Study authors mentioned "Grade 5 chrysotile asbestos" but did not define what the "Grade 5" means.
	Metric 2:	Test Substance Source	Low	× 1	3	Study authors did not report the specific commercial supplier or batch/lot # used to obtain the test substance. In addition, they only used nominal concentrations of asbestos in their experiments.
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity and/or grade of test substance were not reported.
Domain 2: Test Design						
	Metric 4:	Negative Controls	High	× 2	2	Study authors reported using an appropriate concurrent negative control group (i.e., all conditions equal except chemical exposure).
	Metric 5:	Negative Control Response	High	× 1	1	The biological responses of the negative control group(s) were adequate (e.g., mortality of control fish "20 percent in the chronic tests).
	Metric 6:	Randomized Allocation	Medium	× 1	2	The study reported methods of allocation of organisms to study groups, but there were minor limitations in the allocation method.
Domain 3: Exposure Characterization						
	Metric 7:	Experimental System/Test Media Preparation	High	× 2	2	The experimental system and methods for preparation of test media were described in adequate detail and appropriately accounted for the physical-chemical properties of the test substance. Water and asbestos were completely changed every other week and loading (wet weight of fish per liter) did not exceed 0.33 g/l. Analyses of asbestos concentrations were performed before and after one water exchange every 4 weeks for 4 months of exposures, and 1 month of recovery following exposure (n = 20 for each concentration).
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	Details of exposure administration were reported and exposures were administered consistently across study groups.
Continued on next page ...						

... continued from previous page

Study Citation:	Belanger, S. E.,Cherry, D. S.,Cairns, J.. 1990. FUNCTIONAL AND PATHOLOGICAL IMPAIRMENT OF JAPANESE MEDAKA (ORYZIAS-LATIPES) BY LONG-TERM ASBESTOS EXPOSURE. Aquatic Toxicology 17:133-154					
Data Type:	Chronic (>21 days); Aquatic; Fish					
Hero ID:	3585046					
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}	
	Metric 9: Measurement of Test Substance Concentration	N/A		N/A	Nominal values are highly uncertain due to the nature of the test substance. As a result, the effect concentrations reported in this study may misrepresent the actual effect concentrations.	
	Metric 10: Exposure Duration and Frequency	High	× 2	2	The duration of exposure and/or exposure frequency were reported and appropriate for the study type and/or outcome(s) of interest.	
	Metric 11: Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	The number of exposure groups and spacing of exposure levels were justified by study authors and adequate to address the purpose of the study	
	Metric 12: Testing at or Below Solubility Limit	N/A		N/A	Asbestos fibers are insoluble in water and organic solvents. Nominal values are highly uncertain due to the nature of the test substance. The effect concentrations reported in these studies may misrepresent the actual effect concentrations.	
Domain 4: Test Organism						
	Metric 13: Test Organism Characteristics	High	× 2	2	The test organisms were adequately described and were obtained from a reliable source. The test species, strain, sex, age, size, life stage, and/or embryonic stage of the test organisms reported and appropriate for the evaluation of the specific outcome(s) of interest	
	Metric 14: Acclimitization and Pretreatment Conditions	High	× 1	1	The test organisms were acclimatized to test conditions and all pretreatment conditions were the same for control and exposed populations, such that the only difference was exposure to test substance.	
	Metric 15: Number of Organisms and Replicates per Group	High	× 1	1	The numbers of test organisms and replicates were reported and sufficient to characterize toxicological effects.	
	Metric 16: Adequacy of Test Conditions	High	× 1	1	Organism housing, environmental conditions, food, water, and nutrients were conducive to maintenance of health and biomass loading was appropriate.	
Domain 5: Outcome Assessment						
	Metric 17: Outcome Assessment Methodology	High	× 2	2	The outcome assessment methodology addressed or reported the intended outcome(s) of interest and was sensitive for the outcomes(s) of interest.	
Continued on next page ...						

... continued from previous page

Study Citation:	Belanger, S. E., Cherry, D. S., Cairns, J.. 1990. FUNCTIONAL AND PATHOLOGICAL IMPAIRMENT OF JAPANESE MEDAKA (ORYZIAS-LATIPES) BY LONG-TERM ASBESTOS EXPOSURE. Aquatic Toxicology 17:133-154				
Data Type:	Chronic (>21 days); Aquatic; Fish				
Hero ID:	3585046				
Domain	Metric	Rating [†]	MWF*	Score	Comments ^{††}
	Metric 18: Consistency of Outcome Assessment	High	× 1	1	Details of the outcome assessment protocol were reported and outcomes were assessed consistently across study groups (e.g., at the same time after initial exposure) using the same protocol in all study groups.
Domain 6: Confounding / Variable Control					
	Metric 19: Confounding Variables in Test Design and Procedures	High	× 2	2	There were no reported differences among the study groups in environmental conditions or other factors that could influence the outcome assessment.
	Metric 20: Outcomes Unrelated to Exposure	Medium	× 1	2	Data on attrition and/or outcomes unrelated to exposure were not reported for each study group, but this deficiency is not likely to have a substantial impact on results.
Domain 7: Data Presentation and Analysis					
	Metric 21: Statistical Methods	High	× 1	1	Statistical methods were clearly described and appropriate for dataset(s) (e.g., ANOVA).
	Metric 22: Reporting of Data	High	× 2	2	Data for exposure-related findings were presented for each treatment and control group and were adequate to determine values for the endpoint(s) of interest. Negative findings were reported qualitatively or quantitatively.
	Metric 23: Explanation of Unexpected Outcomes	High	× 1	1	There were no unexpected outcomes, or unexpected outcomes were satisfactorily explained.
Overall Quality Determination [‡]		High		1.3	
Extracted		Yes			
Continued on next page ...					

... continued from previous page

Study Citation:	Belanger, S. E.,Cherry, D. S.,Cairns, J.. 1990. FUNCTIONAL AND PATHOLOGICAL IMPAIRMENT OF JAPANESE MEDAKA (ORYZIAS-LATIPES) BY LONG-TERM ASBESTOS EXPOSURE. Aquatic Toxicology 17:133-154
Data Type:	Chronic (>21 days); Aquatic; Fish
Hero ID:	3585046

Domain	Metric	Rating [†]	MWF [*]	Score	Comments ^{††}
--------	--------	---------------------	------------------	-------	------------------------

* MWF = Metric Weighting Factor

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \begin{cases} 4 & \text{if any metric is Unacceptable} \\ \left\lfloor \sum_i (\text{Metric Score}_i \times \text{MWF}_i) / \sum_j \text{MWF}_j \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{cases}$$

where High= ≥ 1 to < 1.7 ; Medium = ≥ 1.7 to < 2.4 ; Low = ≥ 2.4 to < 3 . If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

^{††} Reviewers document uncertainties and strengths for each metric, when deemed necessary.

^{**} Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool.(a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].